Free Riding in BitTorrent is Cheap

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 Analyze free riding (not uploading any user data) in BitTorrent with a practical setup

Introduction Goals

- Try different tricks and evaluate their effectiveness
- Examine swarms with different characteristics



BitThief

DCG (ETH Zürich)

Popular P2P system with centralized coordinator (tracker), whose address can be found in the torrent metafile.

Nodes divided into **seeders** owning a complete download of the file and **leechers**, which are still in progress of downloading the file.

Upload decisions are made using a **choking** algorithm based on the download rates received from remote peers. At regular intervals an **optimistic unchoke** takes place which allows new peers to participate more quickly.

Choking algorithm is similar to tit for tat.

We've written a BitTorrent client from scratch in Java, which we used to implement and test the different tricks. A lot of instrumentational code was added to measure many of the aspects of a torent download.



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BitThief Ideas

Our client opens as many connections as possible. The data amounts transferred on these connections are usually more balanced compared to the honest peer's connections.

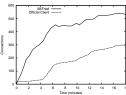
Many Connections - Implications

DCG (ETH Zürich)

- We take advantage of being connected to more seeders, which yields higher download rates directly.
- We are connected to more leechers and thus profit more often from their optimistic unchoke slots.

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BitThief Ideas

 Only large chunks of data (eg. 256KB) verifiable by peers, while exchange units are 16KB Trick remote peers into thinking that we upload lots of valid data in order to be unchoked more often

BitThief Ideas

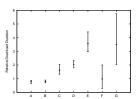
- Only large chunks of data (eg. 256KB) verifiable by peers, while exchange units are 16KB
- Current implementations (Azureus) too clever
- Download rates actually got worse (IP banned)

Results

DCG (ETH Zürich)

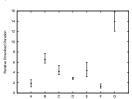
DCG (ETH Zürich)

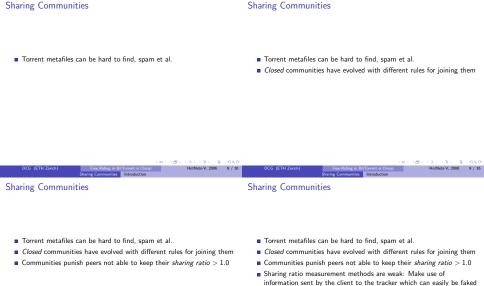
Relative download rates ranging from $0.2\ \text{up}$ to $6\ \text{times}$ the ones achieved by the mainline client.



Results

When considering leechers only, the download rates obtained by BitThief range from 0.9 to 16 times the rates achieved by the mainline client (not ignoring seeders!).





Sharing Communities Introduction

Sharing Communities Tracker Protocol

Tracker HTTP Request

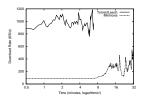
GET /announce?...&uploaded=86016&downloaded=22528&left=81920&...

We downloaded a 12h old file (350MB), three times from within a community and three times from an open tracker. The community swarm consisted of 25 peers and the public one of 830, according to the trackers.

Experiment

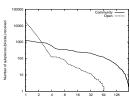
DCG (ETH Zürich)

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Another Experiment

Another 350MB file, much more popular this time (Heroes Episode 5).



Possible Explanations

- More seeders because of docile peers trying to push their sharing ratio in an honest way.
- More generous leechers donating a lot of upstream to push their sharing ratio.

Sharing Communities Explanation

■ Community members more tech-savvy? (less firewalled peers, faster network connections)

Conclusion

- Possible to download entire files without ever contributing a single byte.
- Download speed not much worse compared to honest peers, if worse at all.
- Communities, while actively encouraging collaboration, actually render cheating a lot easier.

BitThief is available at http://dcg.ethz.ch/projects/bitthief/.

DCG (ETH Zürich) Outlook Where to go?

Where to go?

DCG (ETH Zürich)

- How to prevent these exploits?
- Implications of large scale BitThief deployment?

Questions and Comments?

Thank you for your attention!

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http://www.dcg.ethz.ch/